ISSUE PAPER

The Use of Manual Job Aids by Health Care Providers: *What Do We Know?*

Deficiencies in **health care provider** performance in developing countries are due to a myriad of causes (e.g., lack of resources, low supervision and feedback, poor incentives, and undefined work processes). Regardless of the cause of poor provider performance, the traditional solution has been to provide off-site training or continuing medical education. However, there is growing evidence that these resource-intensive interventions are not always appropriate. Thus, demand is growing for other interventions that might help enhance health worker performance in developing countries more efficiently and effectively.[1]

The Quality Assurance Project (QAP) is interested in innovative interventions to improve health care provider performance. This paper focuses on one such intervention: the use of job aids, especially those suitable for use in the manual, noncomputerized health care settings common in the developing world. The concept represents a potentially cost-effective tool to improve the overall process of health care delivery, especially by facilitating compliance with health care standards.[2]

This literature review summarizes the current state of quantitative and qualitative research on different health care provider job aid formats and the impact of these job aids on provider performance. This paper does not address job aids used for consultation with patients. Most of the studies discussed focus on physicians or nurses in the United States. Little research exists on the use of job aids for health care providers in developing country health care settings. Future research needs to focus on this area.

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Center for Human Services, the non-profit affiliate of University Research Co., LLC, provides technical assistance and research in quality design, research, management, process improvement, and monitoring to strengthen health systems management and maternal and child health services delivery in over 30 countries.

The Quality Assurance Issue Paper series provides comprehensive reviews and summaries of the theoretical and operational developments in priority research areas identified by the Quality Assurance Project to advance understanding of how to improve the feasibility, utility, and cost-effectiveness of QA in developing countries.

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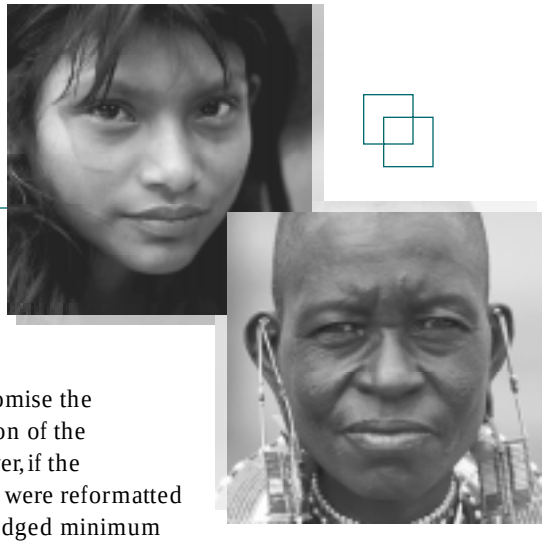

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Definition and characteristics of job aids

Job aids may be defined as repositories for information, processes, or perspectives that are external to the individual and that support work and activity by directing, guiding, and enlightening performance (Rossett and Gautier-Downes 1991). Elsenheimer (1998) defines job aids more succinctly as "the tools to provide just the help a performer needs to do a job, just when the performer needs it, and in just the form it is needed." Job aids are also known as "performance support tools" or PSTs. The function of a job aid is to extend cognitive ability by providing simplified procedures or tasks from which extraneous details have been removed. This approach also enhances memory by relieving workers of the need to remember excess details.

A variety of items might be considered to be job aids in the field of health care. Examples include drug manuals, clinical guidelines, critical pathways, posters, flow charts, clinical algorithms, and physician- or nurse-initiated reminders. However, to be truly termed "a job aid," the item must be designed to make accessible the information, processes, or perspectives needed to do the job. (Rossett and Gautier-Downes 1991). For example, a clinical guideline manual would not be a job aid if used during the patient-provider encounter, because it would waste time and likely compromise the patient's impression of the physician. However, if the guideline manual were reformatted to meet acknowledged minimum criteria, it would be a job aid.

Table 1 ■ Performance gaps and nature of intervention

Potential Problems	Examples of Interventions
Lack of knowledge/skills	Job aids, training, coaching, or mentoring
Flawed environment/ work processes	Work redesign, new/better tools, better match between jobs and workers
Lack of motivation	Provide information about benefits, testimonials, incentives, supervision, structured feedback, revised policies, and training for supervisors

Source: Rossett and Gautier-Downes 1991; Stolovitch and Keeps1992.

According to Ruyle (1990), the commonly acknowledged criteria for an effective job aid are based on the following considerations:

- Stores information, instructions, options, or perspectives in a form that is external to the worker
- Guides the performance of a task in an actual situation in the correct sequence
- Gives clear signals for when to take some kind of action
- Calls attention to important information, using nonverbal devices when appropriate
- Contains sufficient space for any required written responses

In a framework put forth by Rossett and Gautier-Downes (1991), job aids may be classified according to function.

- **Procedural:** Remind workers of the steps or actions to take while performing a particular task. These job aids contain a set of instructions, simply stated and usually illustrated, but with enough detail so workers can take the necessary actions.
- **Informational:** Contain facts or data a worker may need to have in order to perform a specific task. They usually answer the questions "who," "what," "when," "which," and "where."
- **Decisional:** Support decision making, problem solving, and self-evaluation. They answer the "why," "which way," or "which one" questions.

The job aid chosen should be appropriate to the setting, the performance gap to be addressed, the average performer's characteristics, the resources available, constraints on provider performance, and other relevant factors that affect compliance with standards of care (Rothwell 1996).

Obviously, job aids are not the appropriate solution for every performance problem. Table 1 summarizes the types of problems that may result in poor health care performance and the range of interventions that are available.

One should consider a number of factors before deciding that a job aid is the solution to the problem. Rossett and Gautier-Downes (1991) and Elsenheimer (1998) suggest the following parameters.

When to use a job aid:

- When performance of a procedure is infrequent
- When the situation is complex
- When the consequences of errors are high
- When performance depends on a large body of information
- When performance is dependent on knowledge, procedures, or approaches that change frequently
- When there is little time or there are few resources to devote to training

When not to use a job aid:

- When job aids damage credibility
- When novel and unpredictable situations are involved
- When smooth and fluid performance is a top priority
- When the employee lacks sufficient reading, listening, or reference skills

Job aids in health care

Research studies on the application of job aids in health care[3] tend to focus on several key tools, as follows:

- **Reminders:** usually short forms or stickers attached to patient records intended to remind the health care provider to perform a certain task. The major assumption here is that either provider forgetfulness or a focus on other tasks is a barrier to providing quality care (Mandelblatt and Kanetsky 1995). A reminder can be a colored sticker attached to the medical record reminding the health care provider to ask a specific question, i.e., "Does the patient smoke?" (Banks and Palmer 1990).
- **Critical pathways:** management plans that display goals for patients and provide the corresponding ideal sequence and timing of staff actions to achieve those goals with optimal efficiency. Also known as "critical paths," or "care paths," they are usually developed for high-volume, high-cost diagnoses and procedures that permit little variation in the process of care. A pathway usually consists of a flow sheet that includes actions and milestones, and critical elements that should occur at specific times (Holtzman et al. 1998). It is recognized as a quality assurance approach, because it is team based and systems oriented, uses data, and meets the needs of the client.
- **Standards of practice and care:** these job aids are usually found in the form of procedures, protocols, guidelines, and algorithms. They serve to guide the health care worker in providing patient care and are used in both primary and acute care settings. A procedure is a step-by-step instruction on how to perform a task, based on technical and theoretical knowledge. A protocol is a plan or a set of steps to be followed in the care of a specific type of patient, such as a

Examples of job aids (Used with permission from the Johns Hopkins University Center for Communication Programs)

protocol for the care of trauma patients. Guidelines, also known as clinical practice guidelines, are a set of systematically developed statements to assist practitioner and patient decision making about health care for specific clinical circumstances (Field and Lohr, 1990). An algorithm is a format for presenting recommended patient management strategies such as a structured flow chart, a decision tree, or decision grid. Many health systems are developing these standards of practice and care in a form that can be inserted in the medical record and used as a basis for documentation of patient care.

Other job aids frequently found in developing countries include:

- **Picture aids:** aids relying primarily on graphics that are posted on the wall or are accessible as a flip chart at the point of care. In health care, they are often treatment charts or posters illustrating procedures or steps to take. They are also frequently found in laboratories, illustrating the steps to follow in emergency situations.
- **Pocket manuals:** any readily accessible manual used at the point of care; examples include drug guides and treatment protocols in booklet formats.

In developing countries, many of the above job aids have largely been used in information, education, and communication (IEC) campaigns. The impact of the aids apart from the larger campaigns has not been adequately documented.

Theoretical framework

Job aids have their origin in the field of human performance technology, which is the process of selecting, analyzing, designing, developing, implementing, and evaluating programs to influence human behavior and accomplishment most cost-effectively (Geis 1986). This field does not have a unique theoretical foundation. Instead, its theory and experience-based principles are molded by empirical data accumulated from systematic practice over time and draw from such areas as management, organizational development psychology, communication theory, and engineering (Geis 1986).

Other fields contributing to the development of job aids include communication design, software engineering design, instructional design, human factors, and ergonomics. These last two, human factors and ergonomics, study the relationship between people and their occupations, equipment, and environment, and the application of anatomical, physiological, and psychological knowledge to problems arising from these relationships (Pipe 1992).

Job aids address what ergonomics professionals deem to be "relevant inputs" in human performance, i.e., those personal and operational inputs that can be altered with well-designed tools based on extensive task analysis. *Personal inputs* are such cognitive factors as the ability to remember complicated procedures or tasks. *Operational inputs* are the way the process of work is organized (Stolovitch and Keeps 1992).

In general, a person's short-term memory is limited to recalling five to seven pieces of recently learned information at a time. The shift from short-term memory to long-term memory is called "learning," and the resources required to make this shift, usually in training costs, are large.

Job aids have been developed to address these memory and resource concerns. They relieve the user of the need to memorize information and can promote learning over time through repetitive use of the information, all in a cost-effective manner. This is because repetitive use stimulates a passive learning approach: users are not consciously attempting to learn but instead become used to doing a task until they no longer need the aid.

This approach to learning is based on the behavior-engineering model of stimulus-response-consequences developed by Gilbert (1978). Using this model, Gilbert identified six general aspects of behavior that can be manipulated — data, instruments, incentives, knowledge, response capacity, and motives — and proposed that these six elements could be altered to affect individual performance. His model was innovative because it demonstrated that performance support tools other than instruction and training could manipulate certain aspects of behavior effectively.

Research on the comparison of job aids and training/continuing education

Traditionally, competency is considered to be the ability to recall information (Miller 1996); a corollary has been the notion that training is the way to increase competency. With today's health care providers being asked to remember many more kinds of tasks than ever before, the concept of competency has been changed to include the ability to find the right information quickly.

It is important to note that human performance technologists "view training as a last resort to be employed only when no other means of achieving improved performance will work" (Stolovitch and Keeps 1992). The human performance technologist chooses instruction as an answer to performance problems when a job aid cannot provide the amount or degree of learning necessary to acquire skills or knowledge (Mager and Pipe 1970). In a review of the effectiveness of

continuing medical education, researchers (Davis et al. 1992) found that training is often sufficient to establish desired performance at the training site, but once the trainee is back on the job, retention and performance often decline.

In his synopsis of methods of changing physicians' practice patterns, Headrick (1992) points to studies where poor results have been obtained from educational efforts alone and where "successful" interventions have "had only transient effects." In his own research study on improving compliance with cholesterol guidelines, Headrick found that when 59 percent of the study's medical residents attended a lecture, neither the lecture attendance nor improvements in residents' knowledge were associated with significant improvements in performance compliance. In addition, other researchers have found that physician education does not appear to be of value as a cost-savings strategy (Rothenberg et al. 1998).

Although interest in job aids has grown partly as an alternative to training (Rothwell 1996), only a few studies have documented their effects in comparison with training. Margolis (1988) documented experiences where researchers taught medical decision making successfully, using algorithms alone; he emphasized one study in which researchers demonstrated that paramedics learned the procedures for prehospital management of cardiac arrhythmias significantly better when trained with algorithms than when trained with a lesson and paper test. Margolis also completed a study comparing the effectiveness of clinical algorithms with that of equivalent clinical texts. When tested on simulated cases, preclinical, clerkship medical students, and pediatric house officers at all levels of training learned to manage fever and meningitis in a child under two years of age more thoroughly and quickly from clinical algorithms.

Although job aids have been cited as effective in enhancing health worker performance,... they alone, do not change practice behaviors. Organizational factors, including the type of practice, the infrastructure, and the reimbursement policies are held by many to be the most powerful determinants of clinical practice.

Research on job aids as a supplement to training/continuing education

When used in training situations, job aids are designed to transfer skills from the training site to the worksite and provide the direction workers need to perform newly acquired skills on the job (Broad and Newstrom 1992).

A handful of studies compare the effect of job aids combined with training/education against training/education alone. The results have been mixed. The unit of analysis for most of these studies was patient outcome, not provider performance. Thus, it is difficult to arrive at any conclusions about the activities undertaken. In the Prislin (1986) study of the effect of reminders and education on stool occult and breast examinations, medical residents were randomized into three groups: (a) baseline group, (b) conference on health screening plus placement of flow sheet in patient records, and (c) conference on health screening without flow sheets. Although the study obtained mixed results (statistically significant improvements in physician performance of breast examinations but no statistically significant increase in stool occult blood exams with the use of a flow sheet), Prislin concluded that in the absence of the flow sheet, physician education alone had little or no impact on physician-screening behavior.

In two studies on the use of reminders in smoking counseling, Cohen et al. (1987, 1989) compared a group receiving lectures (the controls) to a group receiving lectures with reminders and/or nicotine gum to present to patients. In the first study, health care provider compliance with smoking counseling significantly increased by 32 percent with one reminder and by 56 percent with the reminder plus nicotine gum. There was no improvement for the control group receiving the lecture alone. In the second study, physicians were randomly assigned into similar groups. Again, the physicians in the reminder group performed significantly higher than the control group. Smoking cessation rates for the physicians' patients a year after the intervention were highest for the reminder group and lowest for the lecture group.

Strecher et al. (1991) also conducted a study in smoking prevention but with different results. Medical residents were randomized into four groups: (a) controls, (b) those who received intervention in the form of a two-hour educational program in smoking cessation counseling, (c) those who received intervention in the form of a patient-based reminder to assist them in counseling, and (d) those who received an intervention in the form of an educational program plus reminder. Six months after the intervention, physician self-reports showed that residents in the tutorial-plus-reminder and tutorial-only groups had used significantly more counseling techniques than did the prompt-only or control residents.

Although job aids have been found to greatly reduce the length of training time in military settings (Harless 1986) and in on-the-job training time at major companies, such as IBM (Wilcox 1992), their reduction of the time involved in health care training has not been adequately documented.

Importance and relevance of job aids to quality assurance in health care

A major principle of quality assurance in health care is assessing or measuring provider performance and then ensuring that performance conforms to standards. In cases where performance fails to conform to standards, the solutions must address the root causes. The field of quality assurance holds that poor performance of workers is only marginally due to behaviors or attitudes but substantially due to the system and processes around the workers. Quality assurance initiatives often employ process and root-cause analyses to reach a better understanding of which points in processes and systems are not working well and why they are not. In this approach of focusing on processes, quality assurance practitioners look at ways providers can better work within the process or mobilize the organizational resources at hand (Laffel and Blumenthal 1993). Certain job aids, therefore, are meant to address a health care provider's ability to perform better by making information readily available at the time of the patient-provider encounter.

Performance technologists design job aids using the same rigorous process and root-cause analyses with classic quality tools, such as flow charts, histograms, pareto charts,[4] critical paths, and run charts (Rothwell 1996). Often health care job aids are meant to increase important dimensions of quality, such as continuity of care, technical competence, interpersonal relations, efficiency, and safety (Franco et al. 1997).

When designed as reminders, job aids primarily address continuity of care by mitigating such disruptions to care as missed appointments and the failure to perform tests or receive test results. They address technical competence by providing instructions for procedures that health care providers have not mastered. They promote efficiency through their streamlined design. Some job aids address safety concerns by providing instructions for tasks in which the consequence of error is high. Many job aids are designed to enhance compliance with standards by converting a standard into an easy-to-use reminder or check sheet.

Today, quality-care practitioners champion clinical practice guidelines and critical pathways as ways to reduce inefficiency and improve care. Serious problems remain, however, concerning the implementation of guidelines in actual practice despite evidence of a host of operational measures that facilitate compliance with guidelines in the workplace. In a review of factors that improve guideline use, education and incentives were far less important than such operational factors as accessibility to readable guidelines at the time and point of care, reminder and alert systems, ease of access to patient information, and ease of executing orders or plans (Elson and Connelly 1995).

However, although job aids have been cited as effective in enhancing health care provider performance, they alone do not change practice behaviors. Organizational factors, including the type of practice, the infrastructure, and the reimbursement policies, are held by many to be the most powerful determinants of clinical performance (Battista et al. 1991). Indeed, in their review of reminders, Harris et al. (1990) found that these interventions rarely increase performance beyond 60 percent. They also concluded that these devices address forgetfulness and distraction but not other organizational barriers to quality performance.

The effect of job aids

Over the years, trainers and public health specialists have realized that the role of health care workers has expanded. Their jobs are no longer limited to a mere adherence to instructions; instead, their work now calls for skills in problem solving, decision making, and effective communication with the community. As a result, the support systems offered to primary care providers have been extended from providing information pieces to providing them with decision-making instruments that empower and equip them for multiple responsibilities.

The literature is rich with records of these experiences, primarily in developed-country health systems. Rothenberg et al. (1998) found that job aids seem to be best used for preventive care activities where the action required is straightforward and yet much information is required. Indeed, most job aids have been designed in the preventive care field; the notable exception is the recent emergence of critical pathways for acute care.

The following sections summarize findings about the use of job aids in preventive and acute care. The analysis is not exhaustive, but rather an informative sample of the research currently available. The studies discussed were selected if the population of interest was composed of health care providers in practice or training; the intervention under research met the appropriate criteria for a manual job aid; and the outcomes assessed were a combination of provider performance, process of care, and patient health. However,

there is a lack of study comparability, external validity of results, and selection bias among the studies. The wide range of research designs, intent of interventions, sample sizes and variability, setting and populations, and criteria for outcome measures makes comparison speculative at best.

QAP acknowledges that hundreds of job aids have been developed for use in developing countries in the form of cue cards, flow charts, posters and pictorial counseling cards, pocket guides, etc., for use with topics such as acute respiratory illness (ARI), integrated management of childhood illness (IMCI), sexually transmitted disease (STD) and family planning. Although these job aids are frequently encountered, we were able to find little research on their use or impact. We contacted key personnel at several international health organizations regarding the job aids they had produced and were informed that their respective job aids have been pilot-tested, but not field-tested.

Effect of job aids in preventive health care

Provider forgetfulness, lack of time, patient refusal, and logistical difficulties for providers are among the major reasons that providers perform prevention activities less frequently than recommended by established guidelines (Cheney and Ramsdell 1987; McPhee and Detmer 1993; Mandelblatt and Kanetsky 1995; Dickey and Kamerow 1996). Other common barriers include fear of loss of autonomy, skepticism about the value of preventive health care, lack of reimbursement by third-party payers or other cost concerns, lack of training in medical school on patient education in risk-factor modification, and overall organizational barriers (Robie 1988; Turner et al. 1994; Spain et al. 1998).

Researchers (Rich et al. 1989) have documented a gross overestimation by health care providers of their performance; in one study sample, 94 percent agreed that "most of my clinic patients have been screened for hypercholesterolemia" when, in reality, only 39 percent had been screened (Headrick 1992).

A summary of the effects of various job aid interventions in preventive care that have been documented in the literature appears in Table 2.

Many of the studies obtaining a statistically significant improvement with the use of job aids had additional components as part of the intervention (Prislin 1986; Cohen et al. 1989; Cummings et al. 1989; Belcher 1990; Headrick 1992;

Table 2 ■ Selected Studies on Manual Job Aids in Preventive Care (in chronological order)

Investigator	Target Area	Intervention	Statistically Significant Improvement	Other Findings
Rodney et al. 1983	Immunizations	Prospective chart audit of family practice residency program. In the 3rd year, medical record was redesigned to prompt for immunization. Tetanus and pneumococcal vaccines were put on health maintenance inventory, but influenza (control) was not.	Targeted immunizations increased by 15% as opposed to influenza, which stayed the same.	
Cohen et al. 1982	Various preventive health care tasks	Attending medical residents saw patients in 2 control clinics and 2 intervention clinics and used patient-specific checklists of all recommended preventive health care procedures appended to a patient's chart as a reminder to medical residents to administer various preventive health care tasks.	Over the 4-month study, only 5% of the eligible controls received pneumovax, while 42% of patients on the experiment groups were immunized. Influenza vaccine was delivered to 4% of control group and 36% of the experiment group; mammography was performed in only 4% of the control groups and 32% of the experiment group.	
Davidson et al. 1984	Various preventive health care tasks	Before-and-after study of randomized patients enrolled in nurse-initiated reminder study. Physicians and nurses received patient-specific health maintenance flow sheets generated from a review of the patients' medical record clipped on charts.	There were significant increases in the performance of stool examination for occult blood (32% to 47%), breast exam (29% to 46%), and influenza immunizations (18% to 40%).	No difference in Pap smears.

Table 2 ■ *(continued)*

Investigator	Target Area	Intervention	Statistically Significant Improvement	Other Findings
Prislin 1986	Stool occult blood testing and breast exam	Medical residents were randomized into three groups: (a) baseline group, (b) conference on health screening plus placement of flow sheet in patient records, and (c) conference on health screening without flow sheets.	Compliance increased in group B for breast exam, from 40% to 70%.	Insignificant increase in group B for occult blood tests, from 39% to 54%.
Cohen et al. 1987	Smoking	Physicians randomized into 4 groups: (a) control with lecture and booklet detailing 4-step protocol on smoking counseling, (b) protocol-reminder stickers placed on patients' charts plus lecture and booklet, (c) nicotine gum for patients plus lecture and booklet, and (d) protocol-reminder stickers and gum plus lecture and booklet.	Compliance significantly increased by 32% with one reminder and 56% with reminder and gum. No improvement for control.	
Cheney and Ramsdell 1987	Various preventive health care tasks	Residents in internal medicine randomized into 2 groups: (a) control with usual process, and (b) intervention receiving a copy of the appropriate generic checklist for the patient attached to each patient's medical record. Audit of records was performed 1 year after intervention.	Residents who received checklists performed appropriate preventive health care measures at a significantly higher rate than the control (52% vs. 22%). The use of the checklist to record results was also associated with significant differences in compliance scores related to the type of age- and sex-specific checklist. For each task broken down, mammography, Pap smear, breast, pelvic, rectal exams, and immunizations showed a statistical difference in improvement.	No difference with control in hematocrit, cholesterol, and occult blood screening.
Madlon-Kay 1987	Various preventive health care tasks	Physicians and patients were instructed to use a flow sheet that listed clinic's minimum recommendations for the periodic health exam. A before-and-after study of charts was conducted.	Statistically significant improvement with proctosigmoidoscopic exam and tetanus-diphtheria immunization.	Compliance for most procedures remained well below the recommended level, and unnecessary testing was not decreased by the intervention.
Robie 1988	Various preventive health care tasks	Medical residents divided into 2 groups: (a) physician-reminder and lecture to increase preventive health care tests and counseling based on patient data, and (b) control with no reminder or lecture. Chart audit of both groups was conducted.	Compliance increased by 28% for cervical smears by group A.	No significant increase in compliance for breast or rectal exams, occult blood, sigmoidoscopy, and mammography.
Schreiner 1988	Various preventive health care tasks	Two general-medicine resident clinics were compared: (a) intervention clinic received chart reminders to increase the promotion of preventive health care measures and (b) control clinic received no reminders.	Significant difference in residents' performance of rectal exam with stool guaiac test (45% vs. 34% in control). After 6 months, intervention performed at 40% compliance, significantly greater than 32% rate in control.	No difference for breast exam or Pap test. The overall proportion of health screening was not statistically significant. One year after implementation, none of the procedures were done at a 50% rate.

Table 2 ■ *(continued)*

Investigator	Target Area	Intervention	Statistically Significant Improvement	Other Findings
Cohen et al. 1989	Smoking	Physicians randomized into 4 groups: (a) control (lecture and protocol on smoking counseling), (b) reminders plus lecture and protocol, (c) nicotine gum for patients plus lecture and protocol, and (d) reminders and nicotine gum plus lecture and protocol.	The percentage of patients with a return visit at 6 months who quit smoking (alveolar carbon monoxide of less than 9 parts per million) was 1.3% (control), 7.0% (reminder), 7.7% (gum), and 6.3% (both). At 1 year, the percentages were 2.7%, 8.8%, 15.0%, and 9.6%, respectively.	
Cummings et al. 1989	Smoking	Physicians and office staff randomly assigned to (a) intervention-receiving training, self-help booklets to distribute to smokers, and encouragement to use a system of stickers on charts as reminders to counsel smokers about quitting and (b) control receiving nothing.	Physicians in the experiment group were more likely to discuss smoking with patients who smoked (64% vs. 44%), spent more time counseling smokers about quitting (7.5 vs. 5.2 minutes), helped more smokers set dates to quit smoking (29% vs. 5% of smokers), gave out more self-help booklets (37% vs. 9%), and were more likely to make a follow-up appointment about quitting smoking (19% vs. 11% of those counseled) than the control group.	Rates of biochemically confirmed, long-term abstinence from smoking (greater than or equal to 9 months) were similar 1 year later among patients in the experiment (3.2%) and control (2.5%) groups.
Gonzalez et al. 1989	Various preventive health care tasks	Physicians randomized into (a) intervention of patient-specific nurse-generated prompts attached to front of each chart and (b) control group without prompt.	Overall compliance significantly increased. Performance of rectal exam and mammograms improved most, increasing from 41% to 93% and 18% to 64%, respectively. There were no significant changes in the control group.	
Belcher 1990	Various preventive health care tasks	Physicians randomized into (a) physician-oriented model that included education and coaching, a chart flow sheet listing recommended activities, and periodic feedback about performance; (b) a patient education model in which patients were mailed an informative brochure advising them to ask physicians for preventive health care services as depicted in a patient-held pocket guide; (c) a health promotion clinic that patients were invited to attend; and (d) control.	Only the health promotion clinic model was effective, tripling prevention rates in its 1st year and sustaining these levels for all 5 years.	Neither the control group rates during the 5-year trial nor the rates for the educational models, either singly or as a combined intervention, changed.
Foley et al. 1990, 1995	Mammography	Retrospective chart audit of intervention with 3 components: (a) identification by the nursing staff of eligible women who were overdue for a mammogram as they presented for care; (b) completion of a checklist by residents indicating whether a mammogram was or was not recommended, and why; and (c) a nurse-initiated backup reminder system for patients who escaped the primary checklist system.	There was a statistically significant rise in mammograms from 44% to 60%. Improvement in mammograms done at least once in the past 3 years was maintained 5 years later, and there was a statistically significant increased rate from the postintervention (73.9% vs. 86.8%) for mammograms done or recommended at least once in the past 3 years. This improvement was also noted for the new	

Table 2 ■ *(continued)*

Investigator	Target Area	Intervention	Statistically Significant Improvement	Other Findings
Foley et al. 1990, 1995 *(cont.)*		Chart audits for mammogram recommendation and completion rates were conducted 5 years later on an original cohort group of women. Preintervention, postintervention, and 5-year postintervention rates were compared within the cohort group.	5-year postintervention group when their rates were compared with the preintervention and postintervention group rates. For mammograms done at least once in the past 3 years, the rates were 34.2%, 45.5%, and 64%, respectively. For mammograms done or recommended at least once in the past 3 years, the rates were 42.6%, 72.7%, and 90%, respectively. In a separate analysis, annual mammogram rates in the new 5-year postintervention group for the 3 years preceding the study were 44.8% (1990), 36.5% (1991), and 36.5% (1992). Among these women, 11.0% had a mammogram in each of the 3 consecutive years.	
Harris et al. 1990	Various preventive health care tasks	Retrospective cross-sectional data from chart review for 3 time periods over a 5-year range. Time periods were (a) no prompt, (b) manual nurse-prompt, and (c) computer prompt.	Overall performance increased from 38% in the no-prompts to 53% in the computer-prompts. Influenza immunization increased from 12% to 59%; mammography increased from 4% to 33%.	Tonometry, breast exam, and pneumococcal vaccination showed nonsignificant 7% to 8% increases. Pap smears declined over 5-year study period.
Strecher et al. 1991	Smoking	Medical residents randomized into 4 groups: (a) control, (b) intervention of a 2-hour tutorial program in smoking-cessation counseling, (c) intervention of a patient-based reminder to assist physician counseling, and (d) intervention of tutorial plus reminder.	Physician self-reports 6 months after the intervention showed that residents in the tutorial-plus-reminder and tutorial-only groups had used significantly more counseling techniques than prompt-only or control residents. Residents in all intervention groups advised more patients to quit smoking than did control group residents.	In the 6-month follow-up, self-reported and biochemically verified patient-quitting rates for residents in all intervention groups were higher than for residents in the control group; however, differences were not statistically significant.
Cowan et al. 1992	Various preventive health care tasks	Randomized physicians in (a) control with no input and (b) intervention receiving generic periodic health exam recommendations plus data supporting each recommendation on outpatient charts during the patient encounter. There was no space on the sheet for recording information.		Results suggest no clinically meaningful improvement in performance of periodic health exams even when periodic health-examination guidelines were available at the time of the physician-patient encounter. The experiment group performed 10.5% of indicated periodic health exams, whereas the control group performed 5.8% of indicated actions. None of the 7 periodic health exam components was performed significantly more in the intervention.

Table 2 ■ *(continued)*

Investigator	Target Area	Intervention	Statistically Significant Improvement	Other Findings
Headrick 1992	Identify and treat individuals with high cholesterol	Physicians randomized into 3 groups: (a) control receiving lecture on importance of screening and treating, (b) intervention of lecture and generic chart reminders of practice guidelines on top of each patient's record, and (c) intervention of patient-specific feedback appended to patient's medical record.	Significant within-group improvements in compliance were noted for Groups B and C but not Group A.	No differences were seen in improvement across study groups.
McIlvain et al. 1992	Smoking	The chart-prompting system was implemented at 2 clinics 1 month after training. Patient exit interviews, during which information on resident counseling on smoking cessation was obtained, were conducted before training, after training, at 3-month follow-up, and at 6-month follow-up.	Counseling significantly improved at clinics where chart prompting was initiated.	Results showed an increase in counseling at 3-month follow-up but regression toward baseline at 6 months. The number of counseling behaviors decreased when the number of patients seen increased.
Yarnall et al. 1993	Mammography	Two clinics were compared: (a) clinic with a reminder for screening mammography on health-assessment form for providers attending 50-year-and-older women and (b) control with usual care. The charts of women with 2 or more office visits during the 3 years were audited to determine how many mammograms were completed.	Significant increase in mammography completion showed up after implementation of the form, from 7.3% to 32.0%. The comparison group had an increase in mammogram completion from 12.0% to 17.8%. The difference between the changes in rates of mammography in the two practices was statistically significant. Among women in the study group who had scheduled health-maintenance visits during the period, the average rate of mammography completion increased from 21.2% to 65.2%.	
Kohatsu 1994	Mammography	Before-and-after study of patient-specific reminder appended to charts of women due for mammography.	In the 1-year intervention period, the number of mammographies increased from 47% to 72%.	
Chang et al. 1995	Smoking	Before-and-after study of intervention chart reminders, fluorescent green stickers with space for recording smoking status.	Chart reminders increased documentation of smoking status from 33% to 83%. The proportion of all patients counseled increased from 6.0% to 13.2%. The documentation of smoking status increased from 33% to 83%. The improvement in counseling to quit occurred primarily by increasing the identification of active smokers.	No detection of an increase in referrals to smoking cessation clinic.

Table 2 ■ *(continued)*

Investigator	Target Area	Intervention	Statistically Significant Improvement	Other Findings
Ricardo 1997	Reproductive health (Guatemala and Mexico)	Two groups of service providers were compared: (a) 1 group using an algorithm of 7 questions, and (b) control group.	*Guatemala:* Service providers who had been trained in the use of the job aid provided information on family planning methods to 36% of their clients compared to 26% in the control. In the last 9 months of 1996, service providers who used the job aid had 124 percent more new family planning clients than in 1995, while the control group saw an increase of 21 percent. *Mexico:* Before introduction of the job aid, only reproductive health services were offered to 5% of clients, with the exception of the Pap test, which was offered to 32% of all women of reproductive age. After training, 21% of women were offered screening for sexually transmitted infections, 35% were offered FP services, and 66% were offered a Pap test. On average, training in the use of the job aid helped increase the number of services provided by 10% compared to the 4-month period before the training.	

McIlvain et al. 1992). Thus, in only a few of the studies can one isolate the effect of the job aids alone. However, in spite of the differences in study designs and the inability to generalize the results to date, some overall observations can be made.

It seems that reminders work best with health care prevention measures that do not demand a massive behavior change or effort on the part of the health care provider or patient. Harris et al. (1990) note in their summary of preventive care studies that job aids increase performance of preventive procedures usually only to the level of about 50 percent and that there is considerable variation among procedures used. Variation by procedure may result from lack of agreement about the effectiveness of a procedure (e.g., the wide acceptance of influenza vaccine at the time of the study as opposed to the debatable value of pneumococcal vaccine). Nonperformance can stem from the health care provider's opinion that a procedure (for example, the Pap smear) did not need to be carried out frequently. Overhage and colleagues (1996) also suggest that poor results in certain studies of job aids and their effects on preventive health care measures are due to the difficulty of carrying out certain procedures. Some of the most significant increases in provider performance centered on mammography screening (Foley et al. 1990; Harris et al. 1990; Yarnall et al. 1993; Kohatsu et al. 1994; Foley et al. 1995); the poorest results were obtained for Pap smears or blood tests (Cheney and Ramsdell 1987; Schreiner 1988; Harris 1990). Thus, a job aid seems to be effective in reminding health care providers to perform certain preventive tasks and procedures which physicians already support. However, there seems to be a need for different performance support tools (e.g., incentives, process redesign, etc.) for more difficult tasks or tasks not recognized as being highly critical.

A comprehensive analysis of why the results of some job aids did not differ significantly from their controls has not been conducted. Overhage et al. (1996), for example, had anticipated high provider compliance with the intervention study of physician reminders and thus did not incorporate a mechanism for capturing the reason for noncompliance. One possible explanation for the poor provider performance in some studies (Prislin 1986; Hutchison 1989; Cowan 1992) is that reminders were not conspicuous enough or were poorly designed. Indeed, nurses and physicians acknowledged in the Hutchison study that they frequently looked at the reminder only after the visit with the patient had ended.

Several researchers have addressed the question of the optimum time to introduce a performance support intervention. A review of research on both computerized and manual job aids and other performance-support tools indicates that providing information at the time of the patient encounter (namely through job aids) had the greatest impact on health care provider actions compared to information presented after the encounter, e.g., through feedback systems (Tierney 1986; Rothwell 1996; Buntinx et al. 1993; Mandelblatt and Kanetsky 1995; Rothenberg et al. 1998).

Although the intervention under investigation was computerized, Tierney et al. (1986) conducted a randomized controlled trial comparing monthly feedback reports of provider compliance with preventive care protocols to specific preventive care reminders used at the time of the patient visit. The study concluded that either delayed feedback or immediate reminders can increase physician compliance with suggested preventive health care protocols, but reminders have a greater effect.

Effect of job aids in acute care

The most frequent job aid focus in acute care has been on critical pathways and not on the more common interventions, such as pocket guides or algorithms used in developing countries. They have been typically developed for surgical interventions. Tasks like medical diagnoses are more difficult to translate into critical pathways because of the differences among patients and their symptoms (Pearson et al. 1995). This difficulty has obvious implications for developing countries, with their demand for job aids for such complicated situations as integrated management of childhood illnesses (IMCI). Table 3 summarizes a sample of studies on the use of job aids in acute care.

The premise of a critical pathway is that the provider performance conforms to a prescribed set of tasks laid out in a specific order and that this pathway has been validated as the optimum sequence and process of care. An assumption is made that the health care providers are performing at an optimum level; thus, in analyzing a critical pathway, researchers are looking at other outcomes, such as time and hospital charges saved (Bowen and Yaste 1994; Goldberg et al. 1998; Spain et al. 1998). Falconer and colleagues (1998) have concluded that critical pathway methods may be effective in patient care services that are less influenced by specialization, professional issues, and external regulation; in settings where patient outcomes are relatively fixed and predictable; and where medical care is integrated across institutions.

Though resources saved is the primary focus of studies on critical pathways, some studies have also shown that clinical outcomes achieved during their use are equal to controls (Bowen and Yaste 1994; Weingarten et al. 1994; Gregor et al. 1996; Huber et al. 1998).

Research on the design of job aids

Although there has been little research to date on the approaches used in the design of job aids, there are two areas in the design process with some documented work: (1) effectiveness of an internal vs. external development approach and (2) effectiveness of computer-based vs. manual job aids.

Internal vs. external design

In their research on reminders and guidelines used in health care, Cowan (1992) and Grimshaw and Russell (1993) concluded that many of the studies showing a statistically significant improvement have one element in common: The aids were patient-specific reminders, generated for the health care provider by a health care support person or by computer. Indeed, this patient-specific approach generated significant improvements in several studies (Cohen et al. 1982; Davidson et al. 1984; Prislin 1986; Foley et al. 1990; Strecher et al. 1991). Cowan's approach and that of others (Madlon-Kay 1987; Robie 1988; Schreiner 1988; Headrick 1992) of providing generic reminders (e.g., national guidelines) did not significantly improve performance of preventive health care procedures by residents. Yet other investigators did obtain some significant improvements (Cohen et al. 1982; Rodney et al. 1983; Cohen et al. 1989; Cummings et al. 1989; Chang et al. 1995). Cowan (1992) cautions that patient-specific reminders generated in other studies require the availability of highly trained ancillary personnel or computerized medical records and may not be feasible in practice settings with few spare resources.

Table 3 ■ Selected Studies on Manual Job Aids in Acute Care (in chronological order)

Investigator	Target Area	Intervention	Statistically Significant Improvement	Other Findings
Emslie et al. 1993	Infertility	Participating practitioners were randomized into 2 groups: (a) intervention with clinical guidelines for infertility care placed in patient record and (b) control.	General practitioners in the study group were more likely to take a sexual history, examine both partners, and investigate both partners.	
Falconer et al. 1993	Stroke rehabilitation	Patients randomly assigned into 2 groups: (a) intervention of rehabilitation services from a team trained in critical pathway method and (b) control with usual care.	Results showed no significant difference between groups in length of stay, hospital charges, or functional status at discharge.	
Odderson & McKenna 1993	Nonhemorrhagic stroke	Nonrandomized control trial was conducted, reviewing utilization data of 2 groups: (a) control with usual care and (b) cases treated with a protocol for treatment of acute stroke with a critical path for nursing care, an algorithm for emergency department care, and suggested admission orders for physicians.	The average length of stay on the acute service decreased from 10.9 days to 7.3 days, reducing the charges per patient by 14.6%. Complications in the form of urinary tract infections and aspiration pneumonia rates decreased by 63.2% and 38.7%, respectively.	No difference in Pap smears.
Bowen et al. 1994	Stroke and hospital costs	Physicians randomized into 4 groups: (a) control with usual process, (b) educational conference on utilization of health screening flow sheet, (c) conference with patient-specific flow sheet, and (d) conference without patient-specific flow sheet.	There were significant savings in hospitalization costs for patients with acute stroke after introduction of a treatment protocol. Tests and treatments provided were similar except that carotid Doppler studies and deep venous thrombosis prophylaxis were more frequently done in those treated with the protocol.	There were no differences in outcome measures such as death or discharge disposition. Medical complications were similar in all groups.
Weingarten et al. 1994	Chest pain	Prospective controlled trial where physicians were separated into 2 groups: (a) control with usual care and (b) intervention employing structured message posted on patient charts with risk information and guideline recommendation of a 2-day hospital stay.	Use of reminders associated with increase in guideline compliance from 50% to 69% and a decrease in length of stay by 26%. A significant reduction in total cost of $898 per patient.	No significant difference was found in the hospital complication rate between patients admitted to the hospital during control and intervention periods, and no significant difference was noted in complications, patient health status, or patient satisfaction when measured 1 month after hospital discharge.
Gregor et al. 1996	Knee or hip arthroplasty	Before-and-after study of pathway implementation.	Nine months after implementation of the clinical path, there was a statistically significant reduction in median length of stay (12 to 9 days) which was sustained for at least 18 additional months. Decreased use of inappropriate perioperative antibiotics and laboratory tests.	No change in postoperative complications or readmission rate was found.

Table 3 ■ *(continued)*

Investigator	Target Area	Intervention	Statistically Significant Improvement	Other Findings
Dzwierzynski et al. 1998	Ulcers	Patient charts and billing data were reviewed for the16-month period before and after initiation of the pathway for ulcer treatment.	A significant reduction in patient length of stay and total charges was achieved after implementation of the clinical pathway. Reduction was seen not only for patients treated with flaps by plastic surgery but also for patients with pressure ulcers who were not specifically targeted, such as those from other services. Total cost saving was almost $11,000 per patient.	The readmission rate did not decrease significantly.
Goldberg et al. 1998	Acute asthma	Prospective analysis of patients with asthma treated by a pathway protocol compared with a retrospective analysis of patients with asthma treated by conventional means.	Among patients treated by protocol, oxygen use declined by 19%, handheld nebulizer treatments by 33%, saline locks by 15%, and intravenous steroid administration by 13%. There was an increase in the use of metered-dose inhalers with spacer by 64% and oral steroids by 18%.	
Huber et al. 1998	Infrarenal aortic reconstruction	Retrospective comparison of outcome, resource utilization, and cost (total and direct variable) between the pathway patients and a prepathway control group.	The pathway resulted in significant decreases in the total length of stay and preoperative length of stay and a trend toward a significant decrease in the intensive care length of stay for the admission during which the operation was performed. The pathway also resulted in significant decreases in both direct variable and total hospital costs for this admission, as well as a significant decrease in the overall direct variable and total hospital costs for the operative admission and the preoperative evaluation.	
Leibman et al. 1998	Retropubic prostatectomy	The patients were subdivided into three groups: (a) baseline: patients who underwent surgery in the six months immediately before the pathway onset, (b) nonpathway: patients treated off the clinical pathway, and (c) pathway: men placed on the clinical pathway.	Average hospital charges and average length of stay were $12,926 and 5.8 days for baseline patients, $11,795 and 5.0 days for nonpathway patients, and $10,042 and 4.0 days for pathway patients, respectively. Implementation of the clinical pathway was associated with lower charges and length of stay in the pathway group, as well as the nonpathway group, with larger reductions in pathway patients. With continuous reassessment and modification of the clinical pathway, both average hospital charges and average length of stay have progressively decreased from $10,540 and 4.9 days in 1994 to $8,766 and 2.7 days in January 1997. Charges were uniformly reduced in radiology, laboratory, pharmacy, operating room, anesthesia, and nursing or routine care.	Incidence of postoperative complications did not differ significantly between the pathway and nonpathway groups. Patient satisfaction was similar in the pathway group and the nonpathway group. Length of stay and hospital charges were significantly lower for high- than for low-volume surgeons, irrespective of the declines observed over time.

Table 3 ■ *(continued)*

Investigator	Target Area	Intervention	Statistically Significant Improvement	Other Findings
Warner et al. 1998	Appendicitis	A prospective evaluation was conducted of clinical pathway compared with historical control patients not cared for by the pathway.	Pathway patients with nonperforated appendicitis were more often discharged from the hospital within 24 hours with lower hospital costs. Pathway patients with perforated appendicitis had shorter hospitalization and lower hospital costs.	
Zehr 1998	Anatomic lung (segmentectomy, lobectomy, and pneumonectomy) and partial and complete esophageal resections	Before-and-after study was conducted reviewing three years of data before clinical pathway implementation and three years after. Records were retrospectively analyzed for length of stay, hospital charges, and outcome.	Comparisons were made before clinical path implementation (Group A) and after (Group B). Group A esophagectomies had significantly greater hospital charges compared with Group B and greater length of stay. Group A lung resections also had a significantly greater length of stay compared with Group B, although charges were significantly less in dollars adjusted for inflation. The most significant decreases in charges for esophagectomies were in miscellaneous charges (61% in dollars adjusted for inflation), pharmaceuticals (60%), laboratory (42%) and radiologic (39%) tests, physical therapy charges (35%), and routine charges (34%). For lung resections the greatest savings occurred for pharmaceuticals (38%), supplies (34%), miscellaneous charges (25%), and routine charges (22%).	Mortality was similar.
Dowsey et al. 1999	Hip and knee arthroplasty	Randomized prospective trial comparing patients treated through a clinical pathway with those treated by an established standard of care at a single tertiary referral university hospital.	Clinical pathway patients had a shorter mean length of stay, earlier ambulation, a lower readmission rate, and closer matching of discharge destination.	
Spain et al. 1998	Traumatic brain injury	Resource utilization data were gathered prospectively for 15 months and compared with data from historical controls from the previous year.	Among survivors, pathway patients had a significant decrease in ventilator days, intensive care unit days, and hospital days.	There were no differences in the incidence of complications or functional outcomes.
Chang et al. 1999	Urological operations	For one year, patients receiving urologic operations were treated according to clinical pathways. The outcomes in terms of length of hospital stay and admission charges of these patients were compared with those of patients treated in another year, before clinical pathways were implemented.	The length of hospital stay significantly decreased from 5.5 to 4.9 days and the average hospital admission charges decreased by 12.9% after implementation. Five of the quality indicators, including the rate of surgical complications, were significantly improved after pathway implementation.	

Brink (1989) conducted a study using a computerized job aid that led to increased infant immunizations, but the system required approximately two hours of clerical time per day for patient-specific data. Hutchison (1989) conducted a similar study with computerized aids, which also led to increased immunizations, but concluded that a simple manual system, such as generic reminders to perform vaccinations, might have been just as effective.

Future directions

Although this paper covers inexpensive, easy-to-implement job aids for health systems with little funds to spare for improved technology, it is worthwhile to note how such inexpensive manual systems compare to the more expensive computer systems currently employed in the United States.

McPhee et al. (1991) cites several distinct advantages of well-designed computerized job aids: (a) they are readily transferable and exportable to a variety of practice settings and can be added to a computer at a minimum cost, (b) they can be used to support health providers handling a variety of conditions instead of just one condition, (c) they are most cost-effective because they target so many more conditions than a manual job aid, (d) they are highly acceptable to staff when designed well, and (e) they offer considerable flexibility for providers.

Morrison and Witmer (1998) agree. In studies comparing the two—manual and computerized aids—they found that, unlike manual aids, computers can control complex task branching, and computer aids seem more likely than passive reading to maintain the provider's attention. Poorly designed manual job aids are typically not executable at the point of care. They often contain vague and undefined words, the devices, are often not in individuals' hands when they have to make decisions, and there is no method of monitoring how or if a protocol or guideline is used.

Other researchers, like Cheney and Ramsdell, (1987) disagree, saying that "the considerable expense of computerizing … would greatly tax the ability of such a program to remain cost-effective … without the need for extensive renovation of office or clinic medical record systems." A comparison of the Cheney and McPhee studies, in fact, demonstrated that the use of computerized and manual job aids for the same intervention (promoting preventive health care measures) have obtained identical results. The manual-reminder group in the Cheney study, however, performed preventive health care measures at a rate that was consistently higher than achieved in the computer-reminder group, demonstrating that equivalent or better results can be achieved with fewer resources.

Harris et al. (1990) also obtained equal results with manual and computer intervention. In this study, physicians were divided into three groups: (a) those who received no prompting, (b) those with manual patient-specific reminders attached to patient charts, and (c) those with a computerized reminder form listing "due" procedures attached to medical records. Performance of seven prompted procedures significantly increased for all patients over the 5-year period for both interventions. In addition, after adjusting for enrollment, most of the differences in performance between the two disappeared. This finding suggests that, over time, the effectiveness of manual and computer prompting systems was similar.

Frame et al. (1994) conducted the only randomized control study on the matter, using a tracking system that generated annual provider- and patient-reminders for all patients with regard to various prevention measures regardless of their appointments and compared it with a manual tracking system based on a flow chart in which provider request triggered the patient-reminders. Overall provider compliance with the health maintenance protocol increased 15 percent in the computer-based tracking group and 4 percent in the manual group. The computer-based tracking group also had significantly higher provider compliance than the manual group for 8 of 11 procedures. Frame et al. (1994) notes that the computer system costs 78 cents per patient and was not associated with increased office visits and patient billings.

Job aids cannot possibly address all the root causes of provider noncompliance with health care measures. This multidimensional problem cannot be fixed with just one intervention. Job aids do, however, address several of the causes (e.g., provider forgetfulness, lack of time, and certain organizational barriers).

Research recommendations

According to interviews with international health project managers, job aids are often created to be part of a health project, but their use or effect is only tested during project implementation. Few research studies exist on the isolated effect or utility of job aids even one month after implementation in an international health setting, where a great deal of health work is handled by community health workers. The actual use, the determinants of use, and the ongoing use of job aids by such workers have not been researched adequately. Several such research questions identified by QAP as being of primary importance for future investigation are briefly discussed below.

Do health care providers use job aids?

Although this paper cites a number of studies on the effects of various job aids, there is still research to be done on the actual use of job aids. Despite the resources and effort devoted to job aid development, disproportionately few evaluations are available of their efficacy, safety, and acceptability when used by health care providers in practice (Weingarten et al. 1994), especially in developing countries. In the study by Cheney and Ramsdell (1987), the use of checklists was associated with the highest compliance scores, but only 39 percent of the physicians in the study used them. The use of the drug manuals, flow charts, algorithms, etc., produced by international health organizations for developing countries has been largely untested.

Are job aids appropriate for community health workers?

All the available literature to date has been on the use of job aids by physicians or medical residents. There have been few long-term studies on the use of job aids by community health workers, who comprise a large group of health care providers in developing countries. Although job aids have been introduced to community health workers in a large number of international health projects, the literature available on the actual use by such workers is very limited.

In one field research project in Tanzania, nonphysicians were trained to use flow charts designed to diagnose diseases. Similar flow charts were later used in Kenya, Lesotho, Guinea Bissau, Colombia, and Egypt. Overall research showed that nonphysicians using the job aids made the same diagnoses in 84 percent of the cases as those made by physicians (Essex 1982). Based on this experience, the World Health Organization (WHO) found that the use of the flow charts in Guinea Bissau and Kenya "demonstrated their effectiveness and led to their being accepted as the most appropriate and effective training method for the rural health personnel in these countries" (Essex 1982).

What factors promote the use of job aids when provided?

Although researchers hypothesize about why health care providers might or might not use job aids, there has been little research on the factors that enable their use. There are many reasons cited as to why a provider might not use a job aid. Often, job aids are poorly designed, and figuring out the format in order to get to the needed information takes too long (Madlon-Kay 1987). Job aids may be posted in prominent places in front of workers and still may not be recognized (Broad and Newstrom 1992). In one study (1986), only 17 percent of the health-screening procedures performed were documented on the flow sheet; the investigator speculates that the inadequate design might have been the reason.

Another barrier to the effective implementation of job aids in the workplace is employee resistance to using job aids in front of their peers or even clients. Where job performance is important to workers in establishing credibility and demonstrating self-worth, using job aids can create a perception of poor job performance or lack of skill (Ruyle 1990). Hence, workers avoid placing themselves in such circumstances.

In his study on the use of algorithms, Margolis (1989) cited a small sample of provider objections to the use of algorithms: Algorithms make health providers into robots or require them to practice "cookbook" medicine. Algorithms may not apply to a specific patient. Health providers do not think algorithmically and, therefore, cannot learn from algorithms.

McDonald and associates (1980) hypothesize that reminders will not persuade physicians to perform maneuvers with which they fundamentally disagree. Many new systems are not successful because of user resistance and cost of data acquisition. Physicians and medical assistants might view reminders as creating more paperwork, particularly if they must document clinical events in both the medical record and on forms used to provide input to the computer (Banks and Palmer 1990).

Although these are all possibly valid reasons as to why providers might or might not use job aids, few of these speculations have been qualified or quantified in any sort of substantiated research.

What is the ongoing utility of a job aid?

Further research is needed to evaluate alternative reminder mechanisms and examine the cumulative effect of repeated use of such reminders over several years. Researchers such as Margolis (1989) state that health care providers who use protocols carefully for weeks to months and then stop still continue to adhere to their logic to some degree. There are few studies, though, supporting this theory.

Neither is there extensive research on the appropriate intervention to take when the aid becomes "stale." Regardless of whether a job aid is manual or computerized, researchers (McDonald et al. 1980; Schreiner 1988; Rothwell 1996) conclude from their work that the novelty of reminders may wear off after the initial implementation period and may require either intermediary reinforcement or insistence on their use on a continual basis. Mandelblatt and Kanetsky (1995) and Rind et al. (1994) have shown that rates of performance compliance with standards often returned to baseline once reminders were withdrawn.

Chang (1995) addresses this issue somewhat in the discussion of a study on the use of reminders for smoking prevention. Documentation of patients' smoking status increased dramatically after the implementation of chart reminders and remained significantly increased after eight months. The study, however, did not allow the team to evaluate the persistence of this effect beyond eight months. The team hypothesized that a decline could be avoided if some posters or seminars were introduced at six months to reinforce this provider behavior.

One of the longer studies to date has been the study by Foley and colleagues (1995) involving a five-year follow-up of a previous study on nurse-initiated reminders for mammography screening. The improvement in mammography screening was sustained five years after the intervention. Harris et al. (1990) studied the performance of preventive care procedures over a period of the same length. Performance of the preventive care procedures rose from 38 percent to 43 percent with manual prompting and to 53 percent with computerized prompting. Increases were not uniform for all procedures, with influenza vaccination and mammography showing the greatest gains and fecal occult blood testing and Pap smears showing either no change or decline.

Is training or promotion needed to stimulate health providers' use of job aids?

Elsenheimer (1998) maintains that a common error is developing a job aid and then simply dropping it into the performer's work environment. He advocates an integrated training and job aid approach, in which the job aid is used during training in a simulated on-the-job environment, thus enabling the trainee to practice before actual use. He recommends the following agenda:

- Provide background about the task
- Introduce the job aid and its content
- Discuss the ease of using the job aid
- Walk students through the use of the job aid step-by-step
- Allow students to practice tasks with job aids under as close to real-work conditions as possible

Although the studies show a consistent pattern of improved performance with use of job aids, the number of health care providers who attempt to use job aids is small. Most of the studies have involved placing checklists or reminders in medical files without any recommendation or encouragement to use them. Cheney and others who have conducted similar studies have hypothesized that it would be worthwhile to find out if encouragement would lead to an increase in use.

How do job aids affect patient outcomes?

There are insufficient data on which to judge the impact of job aids on patient outcomes, since performance of a task is usually the primary measure in most job aid trials. The cost of conducting a long-term, large-scale clinical trial to prove a beneficial effect of job aids on preventive care on clinic outcomes may be hard to justify, given the logical assumption that such an effect does indeed exist. Good preventive care guidelines are generally based on data suggesting that earlier detection of the condition being screened for is associated with better outcomes (Elson and Connelly 1995).

Some people argue that reminders do not have to demonstrate improved patient outcomes because only the change in the process (e.g., the performance of the clinician) has to be demonstrated. This argument is acceptable when the process of care affected (e.g., certain cancer screening procedures) has an obvious relationship to health care outcomes. However, there are numerous aspects of health care for which the relationship between process and outcome is unclear.

Rind et al. (1994) and McDonald et al. (1992) did find some success in making this link. McDonald found that patients in the reminder group were twice as likely as those in the control group to have received an influenza vaccination when eligible and had significantly decreased rates of hospitalization. Rind also demonstrated an improved effect on renal function in a study of a drug reminder system.

What is the best way to apply job aids in quality assurance?

To determine the optimal application of job aids so they can support quality assurance activities, research should aim to address some of the following questions:

- Into which quality assurance activities can job aids be incorporated?
- Can job aids be used to enhance how-to portions of training in quality assurance, such as how to use analysis tools (flow charts, cause-effect diagrams, and data displays)?
- Can job aids be used to enhance the content presented in steps of Quality Design, Quality Control, or Quality Improvement Methodologies?
- What is the best use of job aids in standards development and communication?

What is the optimal approach to developing job aids?

Although there are some studies comparing an internal vs. external development approach, more research is needed on the optimum approach for developing job aids for use in developing countries. Patient-specific reminders require organized, up-to-date record keeping along with personnel dedicated to generating reminders each day. When this requirement cannot be met in certain settings, what is the most appropriate way to introduce a generic aid?

How do training requirements change when job aids are also used?

Although job aids are introduced primarily in developing countries in transfer-of-training situations, little documentation exists as to how this procedure has changed the length, cost, facilitation, and other resource needs of designing such trainings.

Conclusion

Job aids cannot possibly address all the root causes of provider noncompliance with health care measures. This multidimensional problem cannot be fixed with just one intervention. Job aids do, however, address several of the causes (e.g., provider forgetfulness, lack of time, and certain organizational barriers). Their inherent design as a timely prompt can streamline the health care process efficiently, whether used alone or with other interventions.

Health planners and managers working in developing countries have indicated that manual job aids are ideal for preventive health tasks, inexpensive to produce, and often reduce or replace the time and expense needed for conducting off-site training. It is important to stress that the wide and continued use of job aids in this setting, is a clear indicator that even without tests of statistical significance, professionals have tested job aids and found that they contributed to improved performance. With additional research, job aids can be potentially recognized as a highly cost-effective tool to improve health care delivery.

… there are many ways of enhancing health worker performance: redesign jobs or work tasks, improve information flow, improve feedback, improve on-the-job and off-the-job training, use structured practice sessions, improve equipment and tools, improve reward systems, and provide job aids.

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Footnotes

[1] Other measures include, but are not limited to (a) redesigning jobs or work tasks, (b) improving information flow, (c) strengthening supervision and feedback, (d) improving on-the-job training, (e) using structured practice sessions, (f) improving equipment and tools, (g) enhancing reward systems, and (h) using job aids.

[2] Compliance with health care standards is a major concern of QAP. Under Section C, Part C.3 in the project's statement of work under USAID, the project has the mandate to "examine the empirical basis for the design and refinement" of job aids. QAP is interested in evidence that supports the continued use of job aids and research on the optimum design for use by health care providers in developing-country settings.

[3] The electronic performance support system (EPSS) is a computerized job aid designed to provide on-line access to information, software, guidance, advice, data, tools, and monitoring systems to providers. Although not a focus of this paper, EPSS is growing in popularity in the United States.

[4] A Pareto chart organizes and displays information to show the relative importance of various problems or causes of problems. This chart is based on the Pareto principle, which states that whenever many factors affect a situation, only a few factors will account for most of the impact (Franco et al. 1997).